

SCIENTIFIC NOTE

NOTES ON THE LIFE HISTORY OF THREE *CONODERUS* SPECIES OF WIREWORMS IN CALIFORNIA: (COLEOPTERA: ELATERIDAE)

Information on the duration of the larval period of three introduced *Conoderus* species was obtained by confining newly hatched larvae individually in two ounce salve tins containing screened moist soil and a surplus of wheat, both of which were replenished at two week intervals. The larvae were confined indoors where temperatures ranged from 15° to 25°C (60° to 78° F).

Conoderus exsul (Sharp)

Two separate rearings of *Conoderus exsul* were started in 1978. The first, or early group, included 31 larvae which hatched March 19. Of these, 20, or 65%, pupated between July 6 and November 11 of the same year, for an average larval period of 149 days. The remaining 11 larvae pupated the following year between January 18 and March 19, for an average larval period of 331 days. Stone (1976, Pan-Pac. Entomol., 52:304) showed that 16% of June hatched larvae had matured the same year and 84% the second year. The pupal period in this early matured group ranged from 10 to 19 days, averaging 11.7 days. Lower temperatures the second year prolonged the pupal period from 18 to 22 days (Tables 1 and 2).

Larvae which hatched on July 25, 1978, or approximately 4 months later than the above, were used in the second rearing experiment. Of the 53 larvae involved, 13 pupated the same year between October 3 and 25 for an average larval period of 80 days. All remaining larvae pupated the following year between February 28 and May 29, the larval period averaging 242 days. The pupal period for the early and late maturing groups averaged 13 and 17.3 days, respectively.

Conoderus amplicollis (Gyll.) (Gulf Wireworm)

This species was reared in the manner described previously. Of 16 larvae that had hatched on July 20, 1978, none matured the first year. All pupated the following year over a period of 3.5 months from March 23 to July 1. Their larval period averaged 305 days and their pupal period, 14.3 days.

In a 1979 paper, (Stone & Wilcox, Pan-Pac. Entomol., 55:235-238) "The Gulf Wireworm in California," ten of 19 larvae pupated the same year, which was due, perhaps, to their May 5 hatching date.

Table 1. Duration of the larval stage of three introduced *Conoderus* species, Riverside, CA. 1978-79.

Date hatched 1978	Records (no.)	Larvae completing development in					
		1978 Larval period			1979 Larval period		
		Pupations (%)	Range (days)	Average (days)	Pupations (%)	Range (days)	Average (days)
<i>Conoderus exsul</i>							
Mar. 19	31	65	109-237	149	35	305-365	331
July 25	53	25	70-92	80	75	199-295	242
<i>Conoderus amplicollis</i>							
July 20	16	0			100	247-347	305
<i>Conoderus falli</i>							
Aug. 16	11	64	80-106	90	36	229-270	259
Oct. 9	20	10	62-70	66	90	183-291	258

Table 2. Duration of pupal stage of *Conoderus* species, Riverside, CA. 1978–79.

Date hatched 1978	Larvae completing development in					
	1978 Pupal period			1979 Pupal period		
	Records (no.)	Range (days)	Average (days)	Records (no.)	Range (days)	Average (days)
<i>Conoderus exsul</i>						
Mar. 19	10	10–19	11.7	11	18–22	19.5
July 25	12	11–17	13	38	14–20	17.3
<i>Conoderus amplicollis</i>						
July 20	—	—	—	14	11–19	14.3
<i>Conoderus falli</i>						
Aug. 16	7	12–19	16.3	4	16–17	16.3
Oct. 9	2	21–22	21.5	12	10–17	11.4

Conoderus falli Lane (Southern Potato Wireworm)

Of 19 *C. falli* larvae that hatched August 16, 1978 reared on wheat, 8 larvae died in the larval stage. Seven of the remaining 11 larvae pupated between November 4 and 30 the same year, for an average larval period of 90 days. The 4 remaining larvae pupated in 1979 between April 1 and May 12. Their larval period averaged 259 days. The duration of the pupal period for both groups was 16.3 days.

Additional data on the life span of *C. falli* was obtained in 1978 by rearing a group of 20 larvae that had hatched later than usual, on October 9. It is interesting to note that even at this delayed hatching date two larvae pupated on December 10 and 18, for an average larval period of 66 days. The remaining 18 larvae pupated the following year over a period of 4 months from April 9 to July 26. Their larval period ranged from 183 to 291 days, averaging 258 days.

The duration of the pupal period varied with the temperature, from an average of 21.5 days in December to 11.4 days for those maturing the second year during warmer months.

Discussion

Rearing these species of *Conoderus* wireworms indoors, possibly under the most favorable of conditions, one might expect the larvae to develop more rapidly and mature earlier than would be the case for larvae inhabiting dry, weedy fields or soils lacking in suitable food. Conditions closer to the indoor rearing conditions would prevail in irrigated vegetable growing areas planted to green or dry beans or to other crops more palatable for their survival.

As judged by the thousands of beetles attracted to a black light at Riverside, both *C. exsul* and *C. falli* have found climatic conditions and food very favorable. Rearings of larvae of these species showed that, depending upon the time of beetle emergence and egg deposition, from 10 to 65 percent of the larvae may complete development the same year, the remainder the second year. *C. exsul* larvae also appear to have found conditions favorable for survival at Olive, in an avocado grove, where the annual collection of beetles exceeded that obtained at Riverside. However, of interest, was the fact that no *C. falli* adults were collected at this location in the 5 year period 1975-79.

Adults of *C. amplicollis* are not highly attracted to light, nevertheless their presence in 15 counties is an indication that they too have become well established in California soils.

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